THE WEATHER AND CIRCULATION OF JUNE 1950[1]

EUGENE J. AUBERT

Extended Forecast Section, U. S. Weather Bureau

Washington, D. C.

The average upper level circulation over North America and adjacent oceans for June 1950 was characterized by large amplitude ridge and trough systems at high latitudes while systems of small amplitude covered the lower latitudes. (See fig. 1.) The stronger-than-normal ridge over northwestern Canada and eastern Alaska was superimposed longitudinally over the trough in the western United States and gave a confluence structure to the ridge-trough system downstream. The stronger-than-normal westerlies, which are apparent from the large north-south gradient of the 700-mb. height anomaly over eastern North America, extended only a short distance into the western Atlantic. The deeper-than-normal vortex in northeast Canada was centered south of its normal position for June and was superimposed longitudinally over the stronger-than-normal anticyclone in Florida. A trough extended south-southeastward from the Low in northeast Canada into the western Atlantic. At high latitudes this trough represented a strong feature

[1] See Charts I–XI following page 111, for analyzed climatological data for the month.

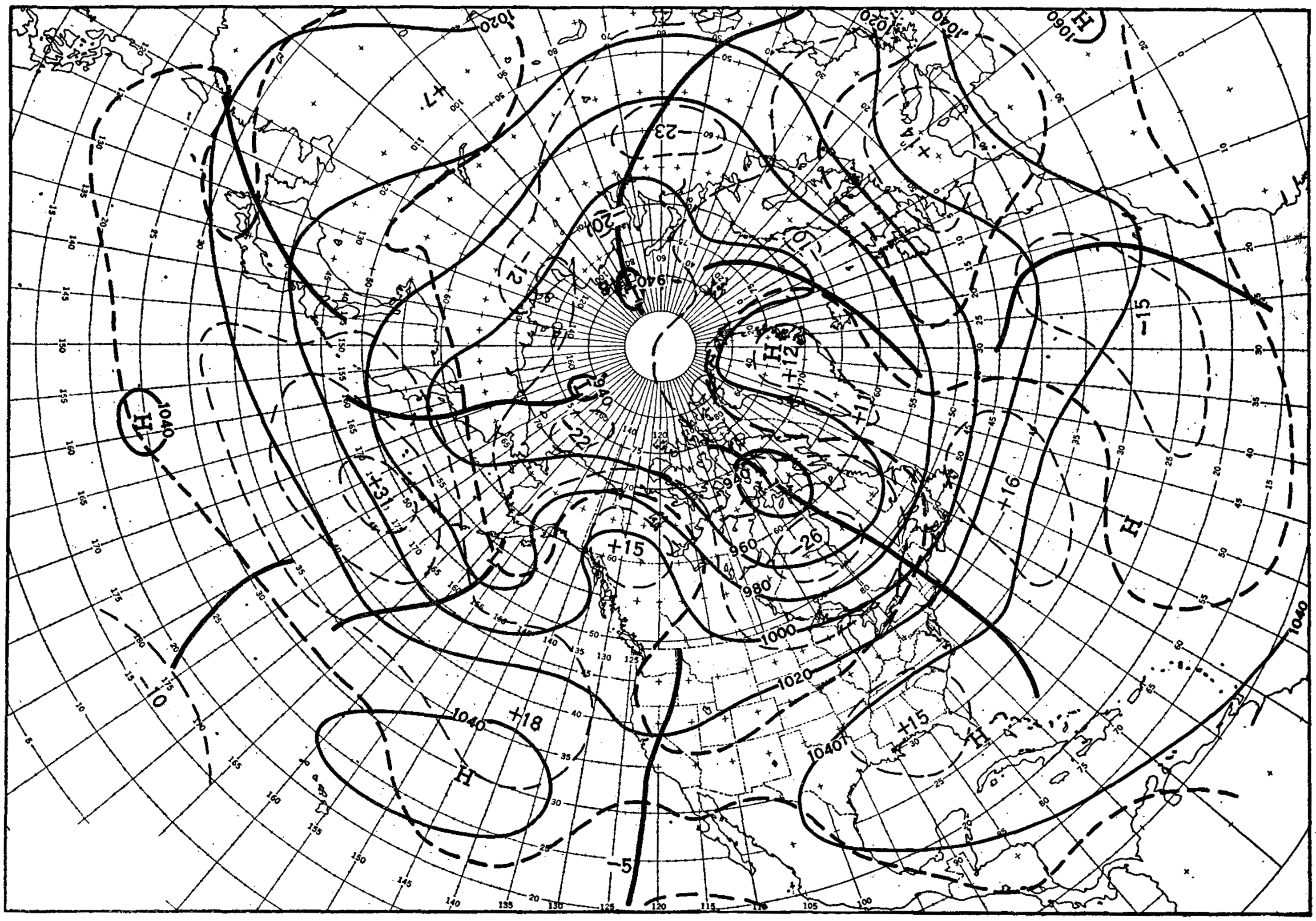


FIGURE 1.—Mean 700-mb. chart for the 30-day period May 30–June 28, 1950. Contours at 200-foot intervals are shown by solid lines, 700-mb. height departure from normal at 100-foot intervals by dashed lines with the zero isopleth heavier. Anomaly centers and contours are labeled in 10's of feet. Minimum latitude trough locations are shown by heavy solid lines.

of the circulation, but at lower latitudes it was rather weak. The east Pacific anticyclone was stronger-than-normal, and its associated ridge extended northeastward into northwestern Canada. A well-defined separation in this ridge at 50° N. is apparent from the non-uniform north-south 700-mb. height gradient and the field of 700-mb. height anomaly. This stronger-than-normal ridge was instrumental in preventing most cyclones from entering North America from the Pacific (Chart III). The only cyclone which was tracked into the continent followed a path through the break in the 700-mb. ridge (fig. 1) and along a weakly defined sea-level trough.

The 700-mb. height anomaly pattern (fig. 1) shows that along the west coast of North America from Washington northward, the average flow was less westerly than normal. This weaker-than-normal upslope motion was associated with the deficiency of precipitation (insert Chart V) and the above normal temperatures (Chart I) in western Washington. The area of below normal temperature anomalies from Montana to Nevada lay in a region of negative 700-mb. height anomalies and northerly flow relative to normal. These cool temperatures caused crops to be a few weeks late in the northern border States. The above normal surface temperatures centered in northern Texas and New Mexico were associated with above normal 700-mb. heights and stronger-than-normal southwesterly flow. A considerable gradient in the anomaly of surface temperature between north Texas and Montana favored cylconic development (Chart III). The cyclones formed here moved east-northeastward with the mean upper level flow along a well-defined trough in the mean sea level isobars. The precipitation associated with these cyclones (insert Chart V) was very discontinuous, mainly due to the effect of the mountains. Heavier-than-normal precipitation fell in southern Wyoming and northern Colorado, mainly on the east slopes of the Continental Divide. In this region the mean sea level flow was from the northeast (Chart VI) and consequently strongly upslope. Most of the precipitation in this region was of a showery nature. In Oregon and eastern Washington the precipitation fell mainly in the region of negative height anomalies and cyclonic curvature of the contours aloft. The westerlies were somewhat stronger than normal along the Oregon coast leading to orographic lifting on the western mountain slopes. Heavy shower and thunderstorm activity during the month caused the Columbia River to rise to flood stages and was responsible for several flash floods in southeastern Washington.

Most of the southwestern United States received only fractional amounts of the normally small June precipitation. Water was scarce and the ranges deteriorated greatly, requiring some supplemental feeding for cattle. The sea level isobars (Chart VI) and the 700-mb. height anomaly (fig. 1) indicate that there was little moisture supplied from the source region to the south. The cooler-than-normal sea level temperatures over much of this region were associated with the trough and stronger-than-normal northerly flow at the 700-mb. pressure surface.

The term "rain shadow" perhaps best describes the deficiency of precipitation in Nebraska, western Kansas, and South Dakota. Considerable crop damage was caused by drought conditions which equalled the record at Huron, S. Dak. Dry air was brought into this region by the stronger-than-normal westerlies which were forced to descend the eastern slopes of the Rocky Mountains (fig. 1). A col in the sea level pressure field lay in this area (Chart VI). The main track of anticyclones in the United States (Chart II) entered this col with the highs forming mainly in the northern Rocky Mountain States and the adjacent Canadian Provinces. These highs followed the mean upper level flow and the ridge in the mean sea level pressure pattern. It is interesting to note that in eastern North America, the main anticyclone track lay well to the south of the 700-mb. belt of maximum westerlies centered at 47° N. The cyclone tracks (Chart III), however, lay to the north of 47° latitude. These cyclone tracks followed closely the well-defined sea level trough and the flow at 700 mb. It should be expected that the cyclone tracks traverse a region of pronounced mean cyclonic shear aloft and the anticyclone tracks traverse a region of strong mean anticyclonic shear. The most striking feature, however, is the sharp separation of the daily cyclone and anticyclone tracks delineated by the monthly mean belt of maximum westerlies. It may be that this is a necessary consequence of strong monthly mean confluence.

The heavy precipitation from Illinois to West Virginia (insert Chart V) was mainly in the form of showers and thunderstorms, with several flash floods occurring during the month. Strong southerly flow at sea level carried considerable moisture from the Gulf of Mexico. This precipitation was also associated with well-developed confluence at the 700-mb. pressure surface. The fast westerlies were also related to the below normal precipitation amounts in New England and the Middle Atlantic States where shower activity was minimized due to the removal of considerable amounts of atmospheric moisture on the western slopes of the Appalachian Mountains. In addition, cyclones were absent from the region during the month (Chart III).

Warmer sea level temperatures than those observed would be expected in Iowa and the Ohio Valley if only the mean flow at sea level and aloft were considered. In summer, however, temperature and precipitation anomalies are correlated negatively, and we have already noted that this was a region of excessive precipitation. The small percentage of clear skies (Chart IV) also indicates the same relationship.

The above normal temperatures in the southeast and along the Atlantic coast were associated with southwesterly flow at sea level, above normal heights aloft, and generally below normal amounts of precipitation. A new monthly mean temperature record for June was established for Jacksonville, Fla.

The heavy precipitation along the coastal regions of Texas and Louisiana was associated with the strong, moist, southeasterly flow both at sea level and aloft (fig. 1). The stronger-than-normal and northward displaced subtropical ridge gave a more easterly type regime than is usual for June. Most of this precipitation fell in very short time intervals. Galveston Airport recorded the near record amount of 14.09 inches during a 24-hour period in violent thunderstorms.

Troughs and ridges on the average 700-mb. contours for June over the United States were located slightly to the west of those for the preceding month. (See *Monthly Weather Review,* May 1950.) A corresponding shift is apparent in the sea level temperature anomaly patterns for the two months. The precipitation anomaly patterns, however, do not lend themselves to such a simple comparison.

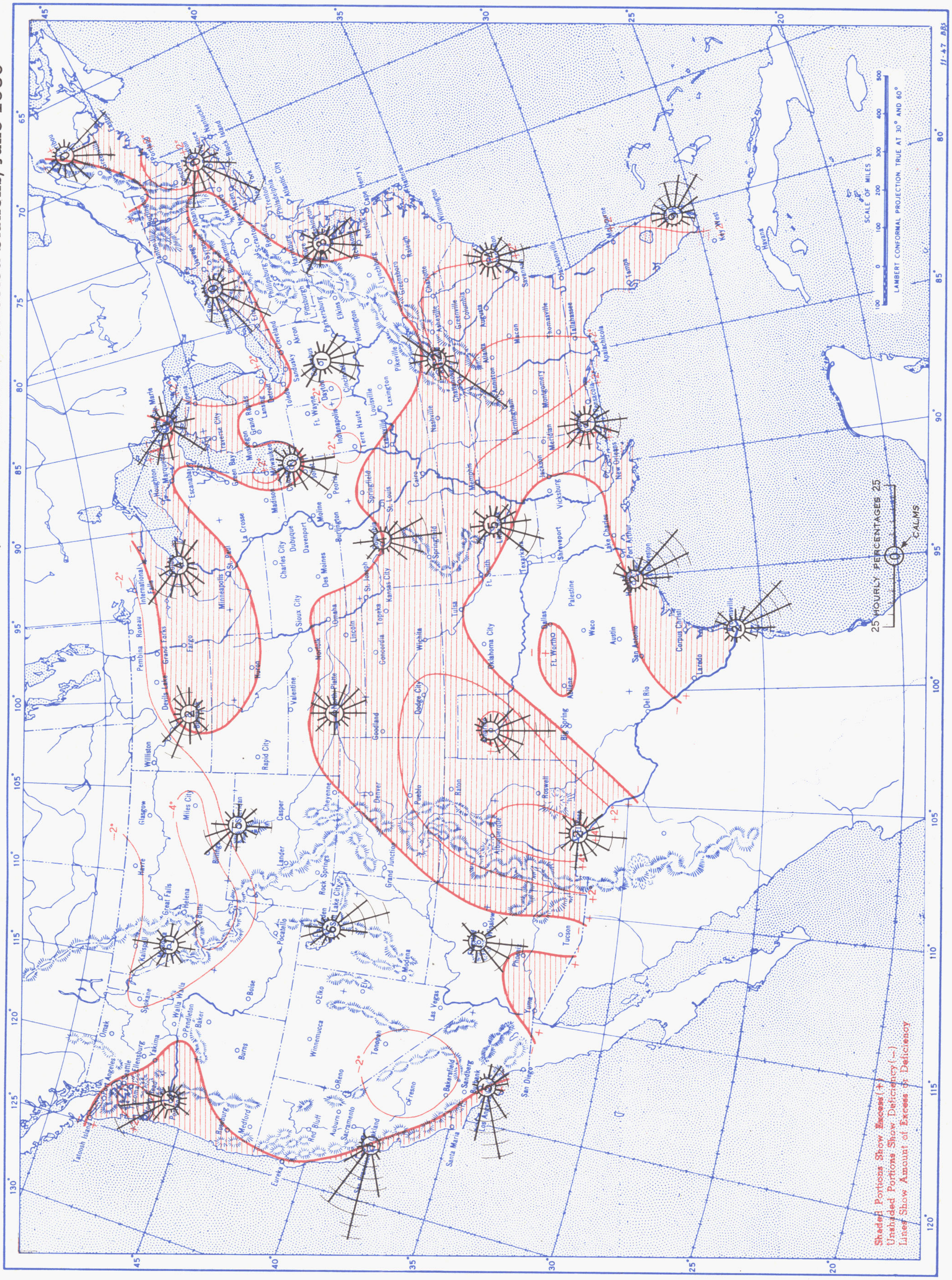
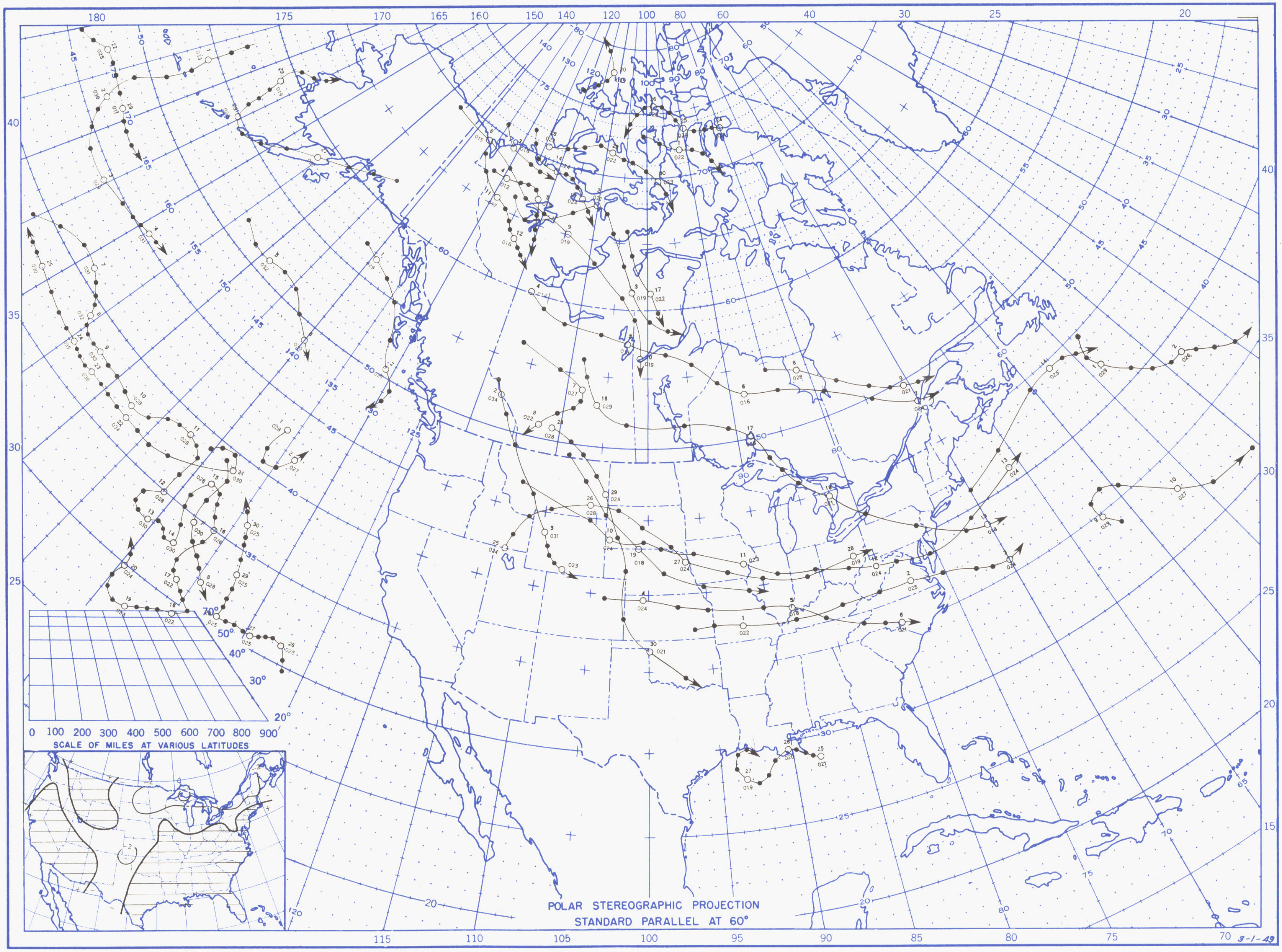


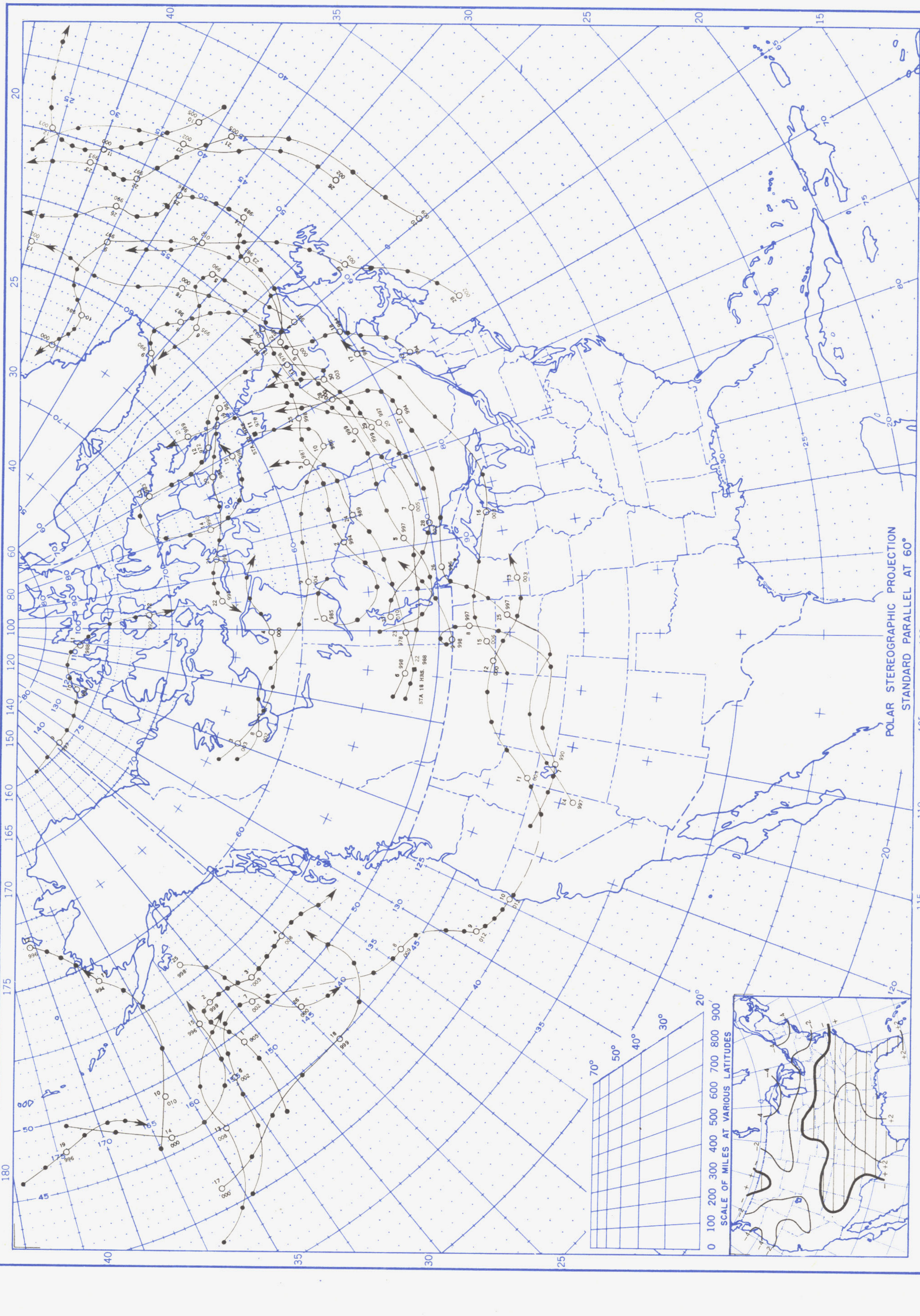
Chart I. Departure (°F.) of the Mean Temperature from the Normal, and Wind Roses for Selected Stations, June 1950

Chart II. Tracks of Centers of Anticyclones, June 1950. (Inset) Departure of Monthly Mean Pressure from Normal



Circle indicates position of anticyclone at 7:30 a. m. (75th meridian time). Dots indicate intervening 6-hourly positions. Figure above circle indicates date, and figure below, pressure to nearest millibar. Only those centers which could be identified for 24 hours or more are included.

Chart III. Tracks of Centers of Cyclones, June 1950. (Inset) Change in Mean Pressure from Preceding Month



Circle indicates position of cyclone at 7:30 a. m. (75th meridian time) Dots indicate intervening 6-hourly positions. Figure above circle indicates date, and figure below, pressure to nearest millibar. Only those centers which could be identified for 24 hours or more are included.

Chart IV. Percentage of Clear Sky Between Sunrise and Sunset, June 1950

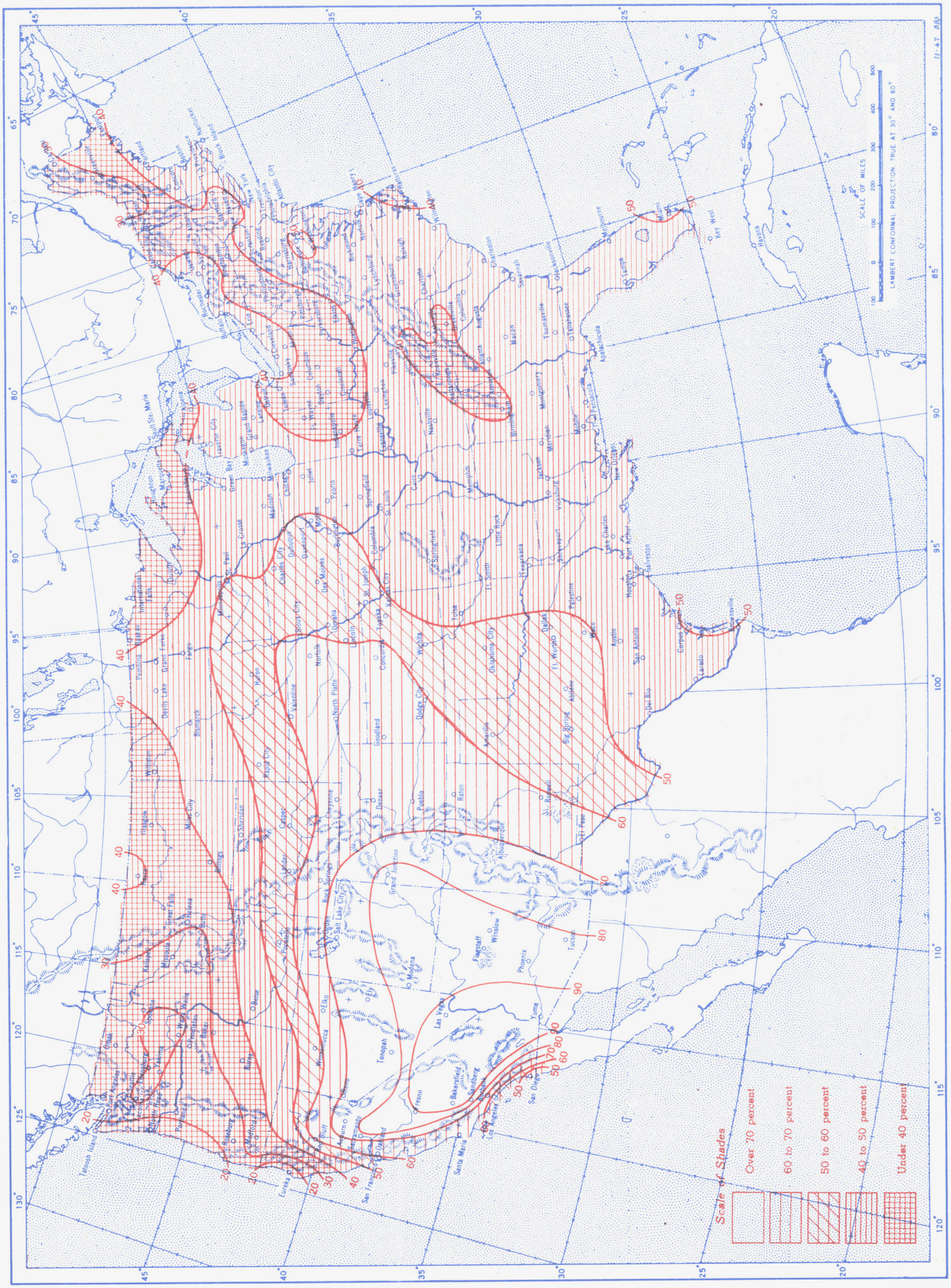


Chart V. Total Precipitation, Inches, June 1950. (Inset) Departure of Precipitation from Normal

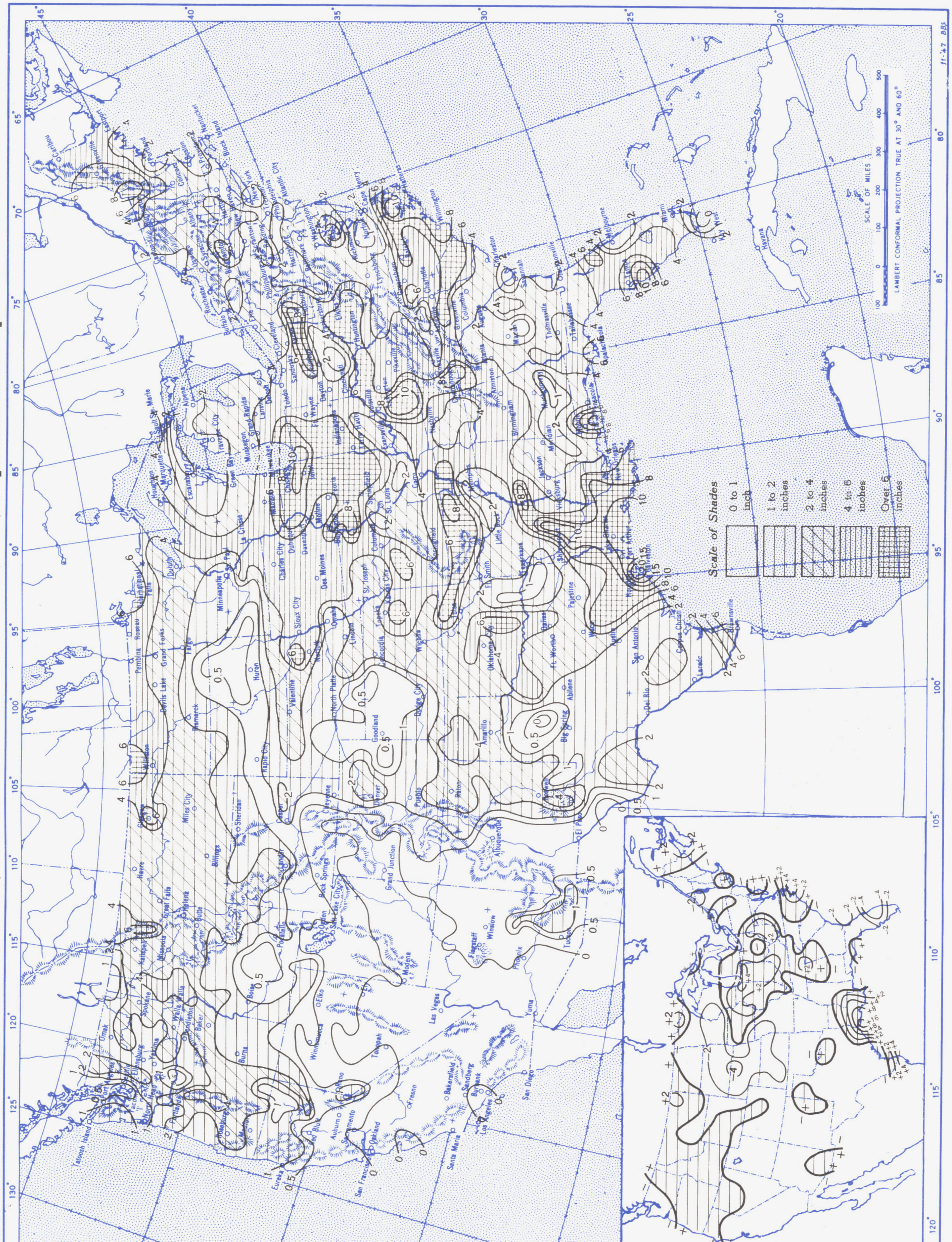


Chart VI. Mean Isobars (mb.) at Sea Level and Mean Isotherms (°F.) at Surface, June 1950

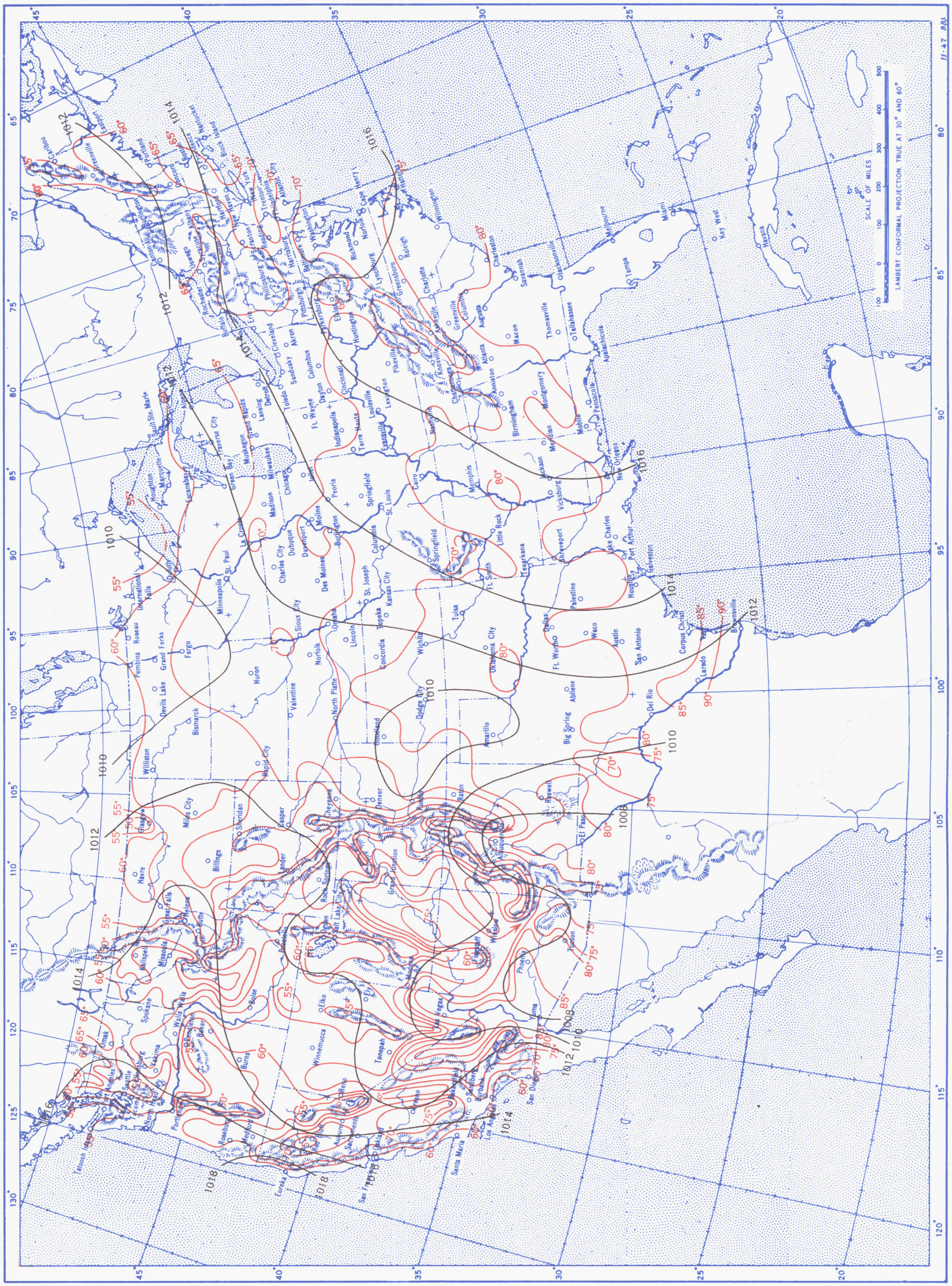
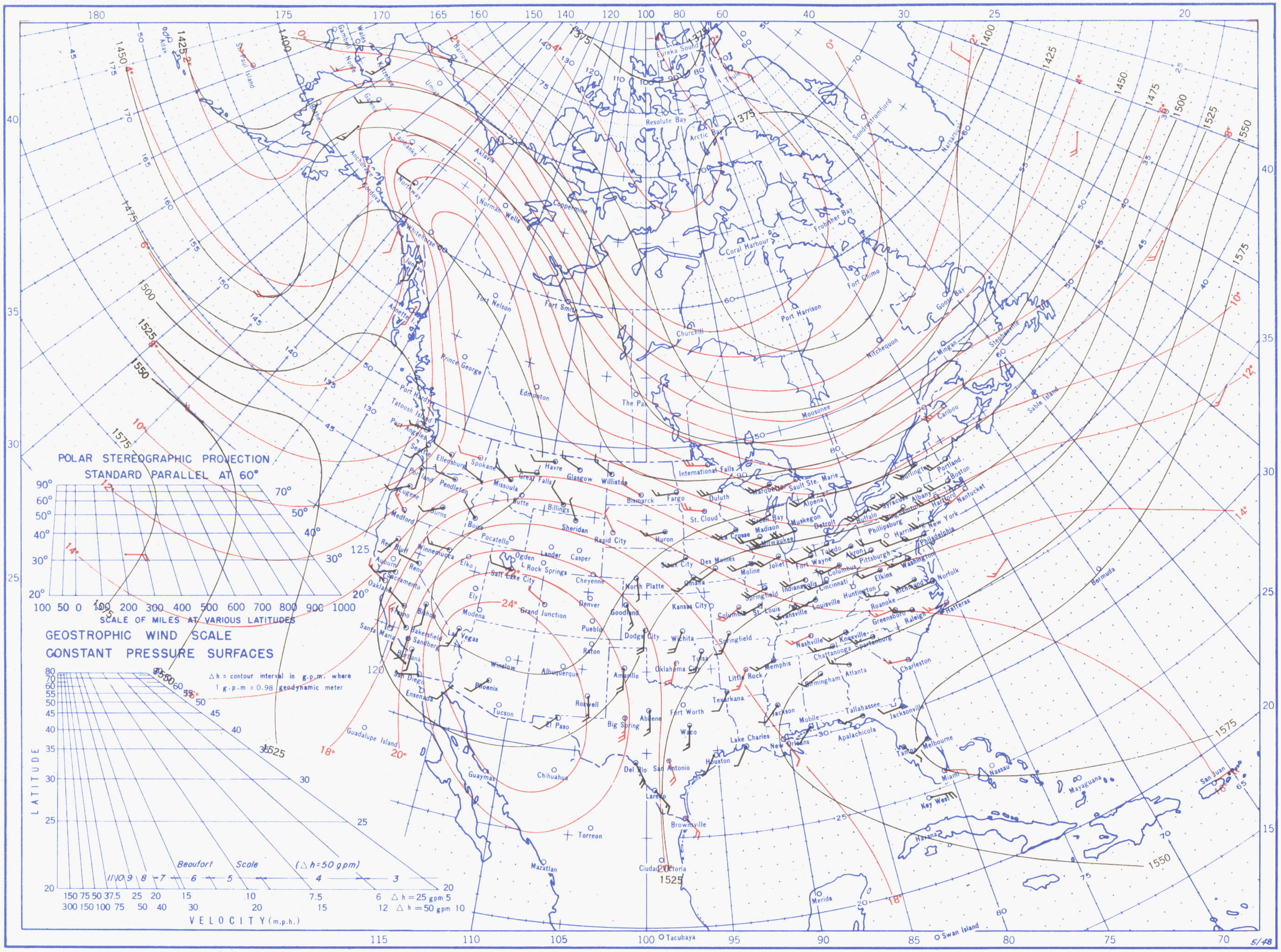
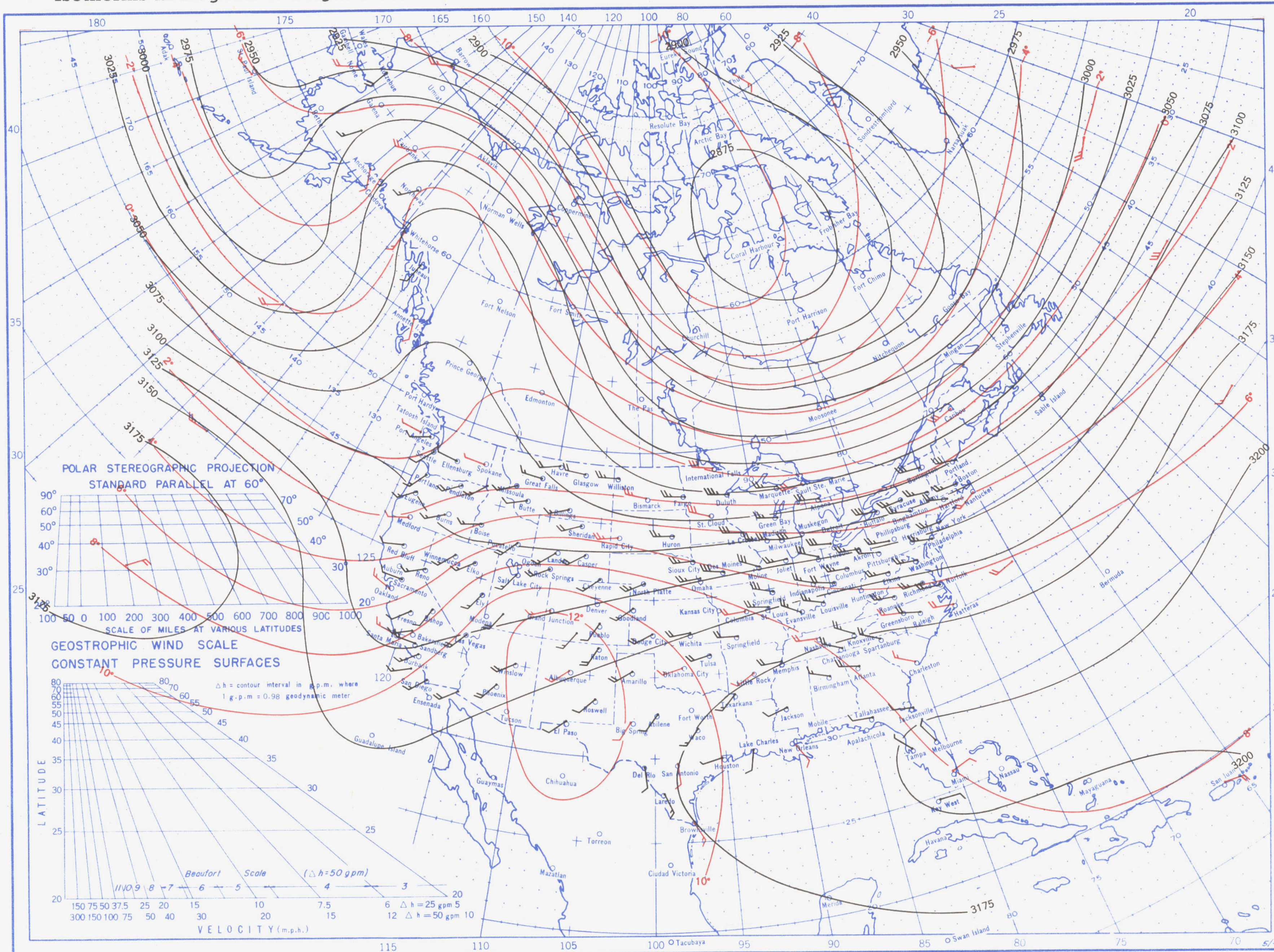


Chart VIII, June 1950. Contour Lines of Mean Dynamic Height (Geopotential) in Units of 0.98 Dynamic Meters and Mean Isotherms in Degrees Centigrade for the 850-millibar Pressure Surface, and Resultant Winds at 1,500 Meters (m. s. l.)



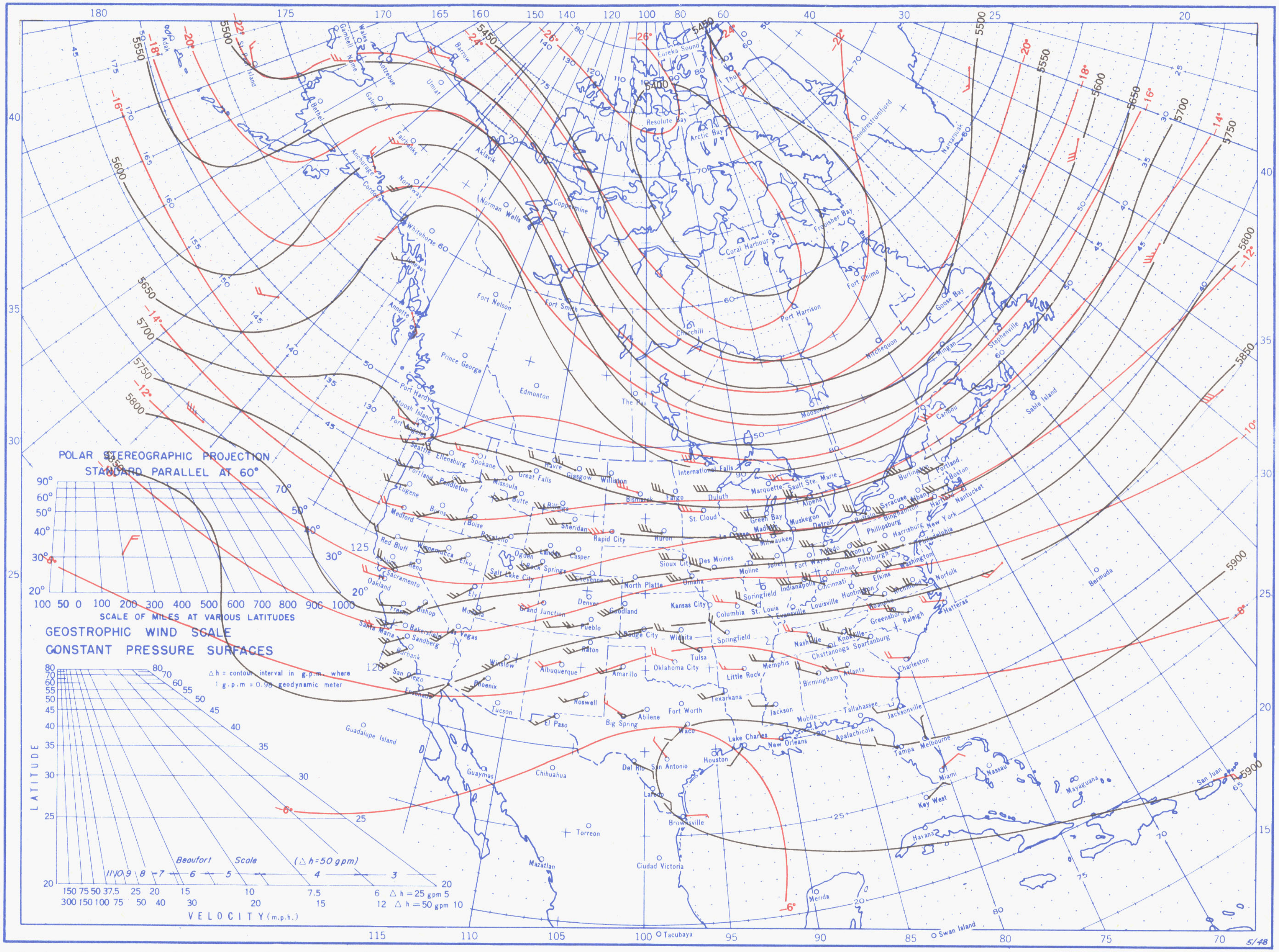
Contour lines and isotherms based on radiosonde observations at 0300 G. C. T. Winds indicated by black arrows based on pilot balloon observations at 2100 G. C. T.; those indicated by red arrows based on rawins taken at 0300 G. C. T.

Chart IX, June 1950. Contour Lines of Mean Dynamic Height (Geopotential) in Units of 0.98 Dynamic Meters and Mean Isotherms in Degrees Centigrade for the 700-millibar Pressure Surface, and Resultant Winds at 3,000 Meters (m. s. l.)



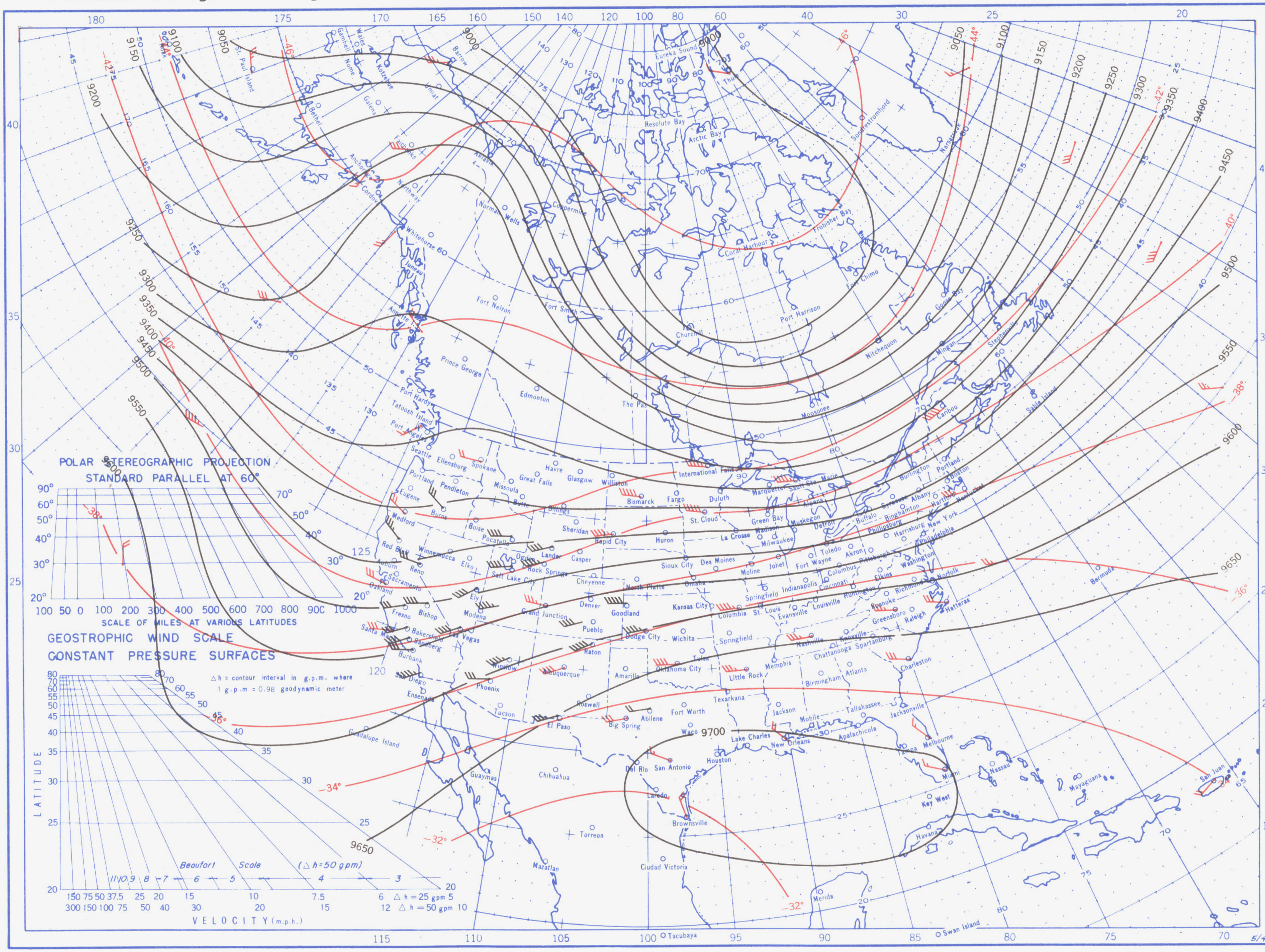
Contour lines and isotherms based on radiosonde observations at 0300 G. C. T. Winds indicated by black arrows based on pilot balloon observations at 2100 G. C. T.; those indicated by red arrows based on rawins taken at 0300 G. C. T.

Chart X, June 1950. Contour Lines of Mean Dynamic Height (Geopotential) in Units of 0.98 Dynamic Meters and Mean Isotherms in Degrees Centigrade for the 500-millibar Pressure Surface, and Resultant Winds at 5,000 Meters (m. s. l.)



Contour lines and isotherms based on radiosonde observations at 0300 G. C. T. Winds indicated by black arrows based on pilot balloon observations at 2100 G. C. T.; those indicated by red arrows based on rawins taken at 0300 G. C. T.

Chart XI, June 1950. Contour Lines of Mean Dynamic Height (Geopotential) in Units of 0.98 Dynamic Meters and Mean Isotherms in Degrees Centigrade for the 300-millibar Pressure Surface, and Resultant Winds at 10,000 Meters (m. s. l.)



Contour lines and isotherms based on radiosonde observations at 0300 G. C. T. Winds indicated by black arrows based on pilot balloon observations at 2100 G. C. T.; those indicated by red arrows based on rawins taken at 0300 G. C. T.